Mental health: market power and governance

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Abstract

This paper is concerned with the pricing behaviour of providers of residential care for people with mental health problems. Two aspects of pricing were considered. First, are there differences between providers’ market power and their actual mark-up rates (e.g. due to differences in motivation)? Second, do the different governance arrangements used in sectors of the industry, such as unified public and non-profit organisation and private bilateral contracting, affect pricing behaviour? A theoretical model was developed to underpin the empirical analysis of 496 residents in 112 mental health care facilities. Private, bilateral organisation was found to be associated with comparatively lower potential price-cost mark-up but a greater propensity to use this power to make profits/surpluses.

JEL classification: L11; I11; L22

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1. Introduction

Residential care services for people with mental health problems are provided by a mix of public, voluntary and private organisations. The first two types have been traditionally dominant providers. However, since the beginning of the 1980s, Government policy regarding residential care has created renewed incentives for
the use of the private (for-profit) sector and, to some extent, the voluntary sector. This policy reform enabled a substantial proportion of public money to go to the independent sector. It encouraged the use of market forces, moving social care away from public bureaucratic arrangements. The growth of state-funded private sector provision was dramatic. The implementation of quasi-markets is the central feature of social care policy changes in the last decade. Much of its impetus is attributed to the New Right policy rhetoric concerning the efficiency raising virtues of markets (Le Grand and Bartlett, 1993; Wistow et al., 1996; Bartlett et al., 1998). This paper seeks to address these claims of the virtues of markets as they have been applied, in practice, to social care.

The paper focuses on the pricing behaviour of providers of residential care for people with mental health problems. The analysis looks first at provider market power (potential price-cost mark-up) and actual mark-up rates and whether they differ. Second, the non-profit and for-profit sectors of the industry are compared according to these performance indicators. The first part of the analysis concerns provider motivation and questions whether all organisations in the industry are profit maximisers in the sense of using all their market power to secure the highest level of profit. The second allows us to comment on comparative efficiency of non-profit/public forms of organisation compared to the private ‘for-profit’ form of the conventional market.

The paper has the following structure. In the remainder of the introduction a brief description of the prevailing demand, supply and governance of mental health care market is provided. In Section 2 the theoretical framework is developed to underpin the empirical investigation of market power. Section 3 has the empirical estimations; Section 4 is the discussion and Section 5 has conclusions.

1.1. The mental health care market

During the late 1980s, the private sector became the largest single supplier in the mental health care industry. Fig. 1 shows the number of places in the residential care market between 1983 and 1996 (Department of Health statistics, 1997, RAC5/SR1; Laing and Buisson, 1998). Fig. 2 shows this information as market shares by sector. The rapid absolute and relative growth of the private sector is clearly demonstrated.

Regarding market contestability (Baumol et al., 1982), various legal constraints exist to regulate entry, such as, the requirements laid out in the Registered Care Homes Act (1984). Attainment of registration to provide mental health care services involves meeting minimum standards relating primarily to: the architecture of the care home, the ‘fitness’ of the manager and owner to run the facility; and to the qualifications and numbers of staff. The registration process is relatively low cost for the potential market entrants (being subsidised by the local authority).

Residential mental health care is labour intensive and offers limited opportunities to substitute capital for labour. Physical capital inputs are predominantly to
address accommodation needs and therefore resource input costs are relatively low and constitute a modest barrier to market entry. Patient’s needs are often complex, uncertain and variable, and these people can be very vulnerable. The ‘technology’ of care therefore needs labour inputs that are reliable, consistent and have considerable acquired expertise, especially with respect to the more specialised and challenging care needs. Costly investment in labour training may then lift entry barriers. A provider’s *reputation* for quality and competence can be a powerful remedy for the informational problems but may also act as a significant entry barrier that gives established providers market power (see Milgrom and Roberts, 1982; Kreps and Wilson, 1982; Forder et al., 1996).

On the demand side of the market around 40% of placements utilise public money in the form of income support payments. Public funding also operates via local authorities and health authorities (who purchase care on behalf of individuals). Another 40% of placements are of this type. Most of the remaining 20% are individuals funding and buying care using their own resources. Knapp et al. (1997) report a recent north London study indicating that 49% of the funding of voluntary sector residential accommodation came from the NHS and 38% from social security payment. The equivalent proportions for private sector facilities were 12% and 84% respectively.

1.2. Governance arrangements

Drawing on the economics of organisation literature, two broad methods of arranging, operating and governing mental health care are identified (Williamson,
Fig. 2. Residential care for people with mental health problems — market share.
The first is characterised by an environment of dispersed property and control rights between purchaser and provider and where high power incentives apply — broadly a market-like governance structure. Williamson defines high-powered incentives with reference to a stakeholder who has residual claimant status, that is, a stakeholder who “appropriates a net revenue stream, the gross receipts and/or costs of which stream are influenced by the efforts expended by the economic agent” (Williamson, 1985, p. 132).

Private sector placements in the study are arranged almost exclusively within this market governance structure. Individuals either purchase care themselves from providers (bilateral arms-length relationships) or have a purchasing agent act on their behalf and rather immutable thereafter; incentives are invariably high powered therefore in the above sense. Placement decisions are made by purchasers and care decisions by providers. Indeed, effective integrated decision-making, although often welcomed by stakeholders, is not characteristic (see Wistow et al., 1996; Lewis and Glennerster, 1996).

The second broad governance arrangement has providers operating in a much more highly vertically integrated environment, with purchasing and providing functions unified under central control and with hierarchical decision-making. Providers in this second group are generally not residual claimants — as argued below — and so incentives tend to be low powered. The public social care bureaucracy clearly falls into this category. Also, much of the voluntary sector is organised such that purchaser and provider collaborate closely, with placement (demand) and service decisions being largely integrated. It is assumed that in the main the voluntary sector approximates closely to hierarchical arrangements. Despite dispersed ownership, decision-making is effectively integrated and incentives are low powered; in practice, much of provider reimbursement is by open-ended, non-specific grant arrangements and close partnership is the norm (Kendall and Knapp, 1996).

Employing this two-way categorisation means that all placements with voluntary and local authority providers are considered hierarchical — the non-profit group. All placements with private providers are treated as secured under market arrangements — the private group. Economic organisation theory would suggest quite different implications for pricing and price-cost mark-up by these two groups.

The first implication is that the non-profits group in our sample will have a low propensity to use its market power to make profit. Unified governance structures generally have low powered incentives for institutional reasons (see Miller, 1992) and also legal reasons, such as non-distribution of profits and fair compensation rules in the voluntary sector, and also in the public sector. Furthermore, people that are less motivated by residual gains (even where they are available), having sets of other-seeking and caring values and social identities, tend to gravitate to
these organisations (for example, see the entrepreneurial sorting theories of Eckel and Steinberg, 1994; Bilodeau and Slivinski, 1996).

The second implication is that providers operating with unified governance will have relatively high ‘market power’ or influence following Milgrom and Roberts (1990). The supporting arguments from the economics of organisation literature refine standard market failure theories; in particular those concerning barriers created by asset specificity and sunk costs, and the opportunities to exploit information imperfections. Indeed, this second implication is complementary to the first. Arrangements that offer low-powered incentives, non-rent-seeking motives and unified structures are most likely to minimise net transaction costs under those circumstances that create market power, i.e. specific assets and poor information (Coase, 1937).

We have two empirical hypotheses. First, given the described demand, supply and governance arrangements, particularly the large number and high diversity of purchasers and the relatively low entry and exit barriers, average market power for the whole sample is expected to be relatively low. Second, we expect the non-profit sector providers to face lower elasticity of demand for their products, i.e. to have higher ‘market power’, but also to have a lower propensity to use market power to make profits.

2. Theory

This section describes the formal underpinning for the empirical investigation in Section 3. An appropriate model for the market as described is one of imperfect competition with a large number of providers. Behaviour is assumed to be oligopolistic with heterogeneous products, but we make no a priori assumptions about the nature of competitive interaction of providers. Indeed, the aim is not to consider market equilibrium per se but rather to calculate market power as it currently prevails in the sample market. A parameter \( \lambda_{ij} \) is assumed to describe the conjectures of the \( i \)th provider with each other provider \( j \). We do not make the assumption that the market is symmetrical: firms can have different cross-price elasticities with the other \( n-1 \) firms in the market.

A general imperfect competition model with product differentiation (Bresnahan, 1989) of the following type is used. Consider a market with \( n \) providers of residential care. To be clear about market power at the provider level we start with the case where each provider supplies one service. Later we develop the model to allow providers to sell more than one product.

Demand (in inverse form) for the service 1 is:

\[
P_1 = h_1(x_1, x_2, \ldots, x_n, y_1; \sigma_1)
\]

where, \( P_1 \) is the service 1 demand price, \( x_1 \) to \( x_n \) are the demands faced by the \( n \) service/providers in the market, \( y_1 \) are demand shift variables and \( \sigma_1 \) is the parameter vector. The usual assumption that \( (\partial x_1 / \partial P_1) < 0 \) and \( (\partial x_1 / \partial P_1) > 0 \) for
is made. Buyers are assumed to be distributed throughout the market according to their tastes for each care product. The partial derivative, $\partial h_j / \partial x_1$, indicates how provider 1’s demand changes when the prices of all other providers are kept constant (the Nash-in-quantity case or Cournot case). However, to allow more general specification of provider conjectures we can be explicit about the dependence of the other providers’ demands on provider 1’s demand:

$$P_1 = h_1(x_1, x_2(x_1), \ldots, x_n(x_1), y_1; \sigma_1).$$

(2)

Allowing $x_2, \ldots, x_n$ to vary, the total derivative of provider 1’s price with regard to its demand (excluding changes in the exogenous variables) is:

$$\frac{dP_1}{dx_1} = \frac{\partial P_1}{\partial x_1} + \sum_{j=2}^{n} \frac{\partial P_1}{\partial x_j} \frac{\partial x_j}{\partial x_1} = \frac{\partial P_1}{\partial x_1} + \sum_{j=2}^{n} \frac{\partial P_1}{\partial x_j} \lambda_{ij}$$

(3)

where $\lambda_{ij}$ is the conjectural variation. In the Bertrand (price competition) case each provider expects its rival’s price to remain constant for changes in its own price. Then, with $P_j(x_j) = \text{const}$, we have: $\lambda_{ij} = -((\partial P_j / \partial x_j) / (\partial P_j / \partial x_j))$. Clearly, then, the direct demand effect $\partial h_j / \partial x_1$ can differ from the total effect.

Provider 1’s residual price differential — the relationship between its price and demand net of responses of other providers — is dependent on that provider’s conjectures about the other providers. This perception is, therefore, an element of the provider’s optimal price function. Indeed, it is the residual price differential that we wish to determine because such an estimate would encompass the effects of competitive interaction as it prevails in the sample market. It tells us about provider market power, which we turn to next.

To proceed in the derivation of the provider’s optimal price function we need to be explicit about provider objectives and cost functions. We assume that average costs have the usual U-shape, albeit with relatively small increases in marginal costs beyond minimum average cost scale because both the capital (mainly property) and labour inputs are quite divisible for the industry (see Darton and Knapp, 1984). We write the cost function as:

$$C_i = C(\bar{x}_i(x_i), w, r, z_i, y_i, \theta_i)$$

(4)

where $w$ is the prevailing price of labour, $r$ is the price of capital, $z_i$ is a vector of cost shift variables such as client dependency levels, where this indicates the level of care required and is thus correlated with total costs. Also, $\bar{x}_i$ is capacity and assumed to be a function of $x_i$; differences between $\bar{x}_i$ and $x_i$ might reflect uncertainty about future levels of demand. The elements of the vector $\theta_i$ are the unknown parameters of the cost function.

We do not have information on the specific incentives/motivations of individual organisations. Therefore, we assume that providers are either profit maximisers or they set prices such that price equals marginal cost. The latter is equivalent to output maximisation on the condition that there is no cross-subsidisation within
the care home (price covers the cost of the marginal resident). Suppose, in particular, that providers are profit maximisers with probability \(\alpha\) and thus \textit{marginal cost pricers} with a probability of \((1 - \alpha)\). Profit maximisers have the usual profit function:

\[
\pi_i = P_i(x_i)x_i - C_i(x_i) \quad (5)
\]

The first order condition is:

\[
P_i(\alpha = 1) = \frac{\partial C_i}{\partial x_i}(\bar{x}_i, w, r, z_i, \theta) - \left( \frac{\partial P_i}{\partial x_i} + \sum_{j \neq 1}^{n-1} \frac{\partial P_j}{\partial x_j} \lambda_{ij} \right) \cdot x_i(P, y, \sigma) \quad (6)
\]

where \(P\) is the vector of all providers prices. Providers either set price as in Eq. (6) with probability \(\alpha\), or at \(P_i = c_i\) with probability \((1 - \alpha)\). The \textit{motivations} parameter, \(0 \leq \alpha \leq 1\), measures the average propensity of providers to use market power to make profit. It is assumed to be exogenously determined, and not directly observable, although it is taken to vary for different identifiable sub-sections, \(s\), of the industry, namely, between the private and non-profit sectors of the industry, respectively, \(s = \rho, \nu \in \alpha\). Above we hypothesised that non-profit providers were mainly operating with unified governance and are expected to have a lower value of \(\alpha\) than private providers (see Section 1).

The expected pricing rule for a given provider \(i\) in market segment \(s\) is therefore:

\[
P_i = \frac{\partial C_i}{\partial x_i}(\bar{x}_i, w, r, z_i, \theta) - \alpha_s \cdot \frac{dP_i}{dx_i}(P, y, \sigma, \alpha_s) \quad (7)
\]

Overall, then, Eq. (7) indicates that a provider’s (expected) price setting will depend on (i) the extent of product differentiation \((y)\), (ii) the conjectural variations parameter \((\lambda_j)\), and also (iii) on the value of motivations parameter \((\alpha_s)\).

Undertaking a direct estimation of Eq. (1) in order to determine the ‘perceived’ price differential \(dP_i/dx_i\) of Eq. (7) presents considerable practical difficulties when, as in our case, the number of own- and cross-elasticities is very large. However, progress can be made instead by using the Baker and Bresnahan (1985) approach, which involves removing the dependence of the other \(n-1\) provider’s prices on the demand function of a representative provider.

For notational convenience we will denote the representative or mean provider in a given market segment \(s\) as provider 1. Hence, the other firms are \(j = 2, \ldots, n\). Using the \((n-1)\) inverse demand equations (Eq. (2)) and the \((n-1)\) supply equations (Eq. (7)) we can solve for \((n-1)\) prices and outputs. The resultant functions can be solved simultaneously to remove the dependence on the \((n-1)\) provider characteristics function, \(y\) (including capacity). The vector \(C_i\) can be
substituted for its reduced form in terms of the pre-determined variables. This manipulation generates, for each service $j \neq 1$:

$$x_j = E_j(x_1, x, w, r, z_1, y_1; \alpha_j, \lambda_j, \sigma_j, \theta_j).$$  \hspace{1cm} (8)

Following Baker and Bresnahan’s (1985) formulation, for each of the $(n - 1)$ providers $j \neq 1$ the differential of $E_j$ with respect to $x_1$ is firm $j$’s reaction function to provider 1. Eq. (8) defines a reduced form equation (for $i \neq 1$) written in terms of provider 1’s output $(x_1)$ and characteristics $(y_1)$. These optimal demands can then be substituted into the inverse demand function to give the equation to be estimated:

$$P_i = h_i(x_i, E(x_i, x_{i1}, w, r, z_1, y_1; \alpha, \lambda, \sigma, \theta), y_1; \sigma_1)$$

$$= h^R_i(x_i, x_{i1}, w, r, z_1, y_1; \alpha, \lambda, \sigma, \theta)$$

where $E$ is the vector of optimal demands for each provider $j$. This function is the residual demand curve for product 1. The elasticity of $h$ with respect to $x_1$ tells us about the market power provider 1 has over its price, taking into account the adjustment of all other providers’ prices and quantities (Bresnahan, 1989, p. 1049). Specifically,

$$\frac{dP_i}{dx_1} = \frac{\partial h^R_i}{\partial x_1}$$

which can be substituted directly into the optimal price function (Eq. (7)) and is a key component in determining price-cost margins. It remains to show how $\partial h^R_i / \partial x_1$ can be estimated.

Thus far we have discussed the single product case; we now move on to consider multiple outputs. Each provider $i$ is assumed to supply $x_i$ products or care ‘services’. The defining characteristic of a service is the care received by an individual. Therefore, the potential number of different services supplied by a provider is equal to the number of residents. To use a general formulation, each $m = 1, \ldots, \chi_i$ refers to an individual service, where $\chi_i \leq x_i$ and each price is $P_{m_i}$. The demand for service $m$ can be written as $x_{m_i}$, which is conceived as the number of service $m$ beds sold. With this notation, the inverse demand for each service is, with direct analogy to Eq. (9),

$$P_{m_i} = h^R_{m_i}(x_{m_i}, x_{i1}, w, r, z_1, y_1; \alpha, \lambda, \sigma, \theta).$$

(11)

Data limitations mean that we do not have values for the $x_{m_i}$ terms. We can proceed, however, by drawing on the relationship between each $x_{m_i}$ and $x_i$, the number of places sold by each provider: $x_i = x_{i1} + \ldots + x_{\chi_i}$. On average, therefore, $x_{i1} = x_i / \chi_i$. Thus, we estimate the following function across the sample of prices $P_{m_i}$ for all $i = 1, \ldots, n_i$ providers in the dataset:

$$P_{m_i} = h^R_{m1}(x_i, x_{i1}, w, r, z_1, y_{m1}; \alpha, \lambda, \sigma, \theta).$$

(12)
We are, nonetheless, interested in mark-up levels as they apply to providers. We can then define the average mark-up level using the residual demand price functions as:

\[
P_t = \frac{\sum_{m=1}^{x_1} P_m}{x_1} = \left( \frac{h_{11}^{R1}(x_1) + \ldots + h_{1x_1}^{R1}(x_1)}{x_1} \right).
\] (13)

Now differentiating we have:

\[
\frac{dP_t}{dx_1} = \frac{\partial h_{11}^{R1}(x_1)}{\partial x_1} + \ldots + \frac{\partial h_{1x_1}^{R1}(x_1)}{\partial x_1}.
\] (14)

If the provider sold identical products such that:

\[
\frac{\partial h_{11}^{R1}(x_1)}{\partial x_1} = \ldots = \frac{\partial h_{1x_1}^{R1}(x_1)}{\partial x_1} = \frac{\partial h_{1}^{R1}(x_1)}{\partial x_1}
\]

then Eq. (14) becomes \( dP_t/dx_1 \equiv \partial h_{1}^{R1}(x_1)/\partial x_1 = \partial h_{1}^{R1}(x_1)/\partial x_1 = \ldots = \partial h_{1}^{R1}(x_1)/\partial x_1 \) which is equivalent to Eq. (10), the price differential in the single-product or provider level case.

Suppose that the equivalent of Eq. (12) was derived for all other providers \( i = 2, \ldots, n \). The empirical model is then:

\[
P_{mi} = b_0 + b_1 x_i + b_2 w + b_3 r + b_4 z_{mi} + b_5 y_{mi} + b_6 x_i + u_{mi}
\] (16)

where the estimated coefficient on output is \( b_1 \equiv \partial h_{1}^{R1}/\partial x_1 \equiv (\partial h_{1}^{R1}/\partial x_1)(1/\chi_1) \). This model is estimated (cross-sectionally) across a sample of all (potential) services from each sample of providers. As the potential number of services is the number of residents, the sample frame is equivalently a sample drawn from all residents, \( \Gamma \), in the market.

Eq. (16) can be re-written as:

\[
P_{mi} = B_{mi}(w, r, z_{mi}, y_{mi}, u_{mi}) + \frac{\partial h_{1}^{R1}}{\partial x_{mi}} x_{mi},
\] (17)

Adding the demand for each service we get the provider level demand:

\[
x_i = \frac{P_{1i} - B_{1i}}{\partial h_{1}^{R1}} + \ldots + \frac{P_{x_i} - B_{x_i}}{\partial h_{x_i}^{R1}}.
\] (18)

Now if demand and prices for each provider’s services were identical and we write provider-level price as the average of each service price: \( P_t = (P_{1i} + \ldots + P_{x_i})/\chi_t \), then the inverse provider-level demand function is:

\[
P_t = \sum_{m} B_{mi} \frac{1}{\chi_t} \frac{\partial h_{1}^{R1}}{\partial x_{mi}} x_{i}.
\] (19)


Differentiating we have:

\[
\frac{d P_i}{dx_1} = \frac{\partial R_{mi}^{\text{P}}}{\partial x_{mi}} \equiv b_1.
\] (20)

Therefore, if each provider’s products are similar then the estimated parameter \(b_1\) of the residents-level model (Eq. (16)) is approximately equal to the residual price differential at the provider level. In regard to costs, each service will have potentially different marginal costs, \(c_{mi}\), due to any differences in cost shift factors. However, marginal costs at the service level are assumed to be constant. Cost inefficiency — assumed to be a constant shift factor — is conceived as part of the organisation’s surplus/profit. Thus, whilst accounting mark-up may be \(P_i - \bar{c}_i\) (the latter term is observed marginal cost), economic mark-up is \((P_i - \bar{c}_i) + (\bar{c}_i - c_i) = P_i - c_i\).

2.1. Market power

We can re-arrange Eq. (7) as follows:

\[
\frac{P_i - c_i}{P_i} = -\alpha_i \cdot \frac{d P_i}{d x_i} \cdot \frac{x_i}{P_i} = -\alpha_i \beta
\] (7')

where, as with \(P_i\), the term \(c_i\) is the average of the (minimum efficient) marginal costs of each service. This expression leads to our definition of market power: \(M_i = (P_i - c_i)/P_i = -\beta\), that is, the mark-up of a profit maximising provider.\(^1\) Market power is then dependent only on the elasticity of price with respect to output of the residual demand function, i.e. \(\beta\).

The model (Eq. (16)) can be estimated in log form, in which case the parameter on \(x_i\), is \(b_i^x \equiv b_i(P/c_i).\) Thus, the estimated parameter \(b_i^x\) of the residents-level model is equivalent to the residual price elasticity at the provider-level from Eq. (20), which is in turn our measure of market power at the provider-level (from Eq. (7')). In notation, extending Eq. (20) this is:

\[
b_i^x \equiv b_1 \frac{P_1}{x_1} = \frac{d P_1}{d x_1} \frac{P_1}{x_1} \equiv \beta.
\] (20')

This functional form for Eq. (16) is somewhat arbitrary and it does present some difficulties in estimation in the presence of heteroscedasticity (see below). How-

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\(^1\) It is important to note that even if the market was inhabited solely by profit maximising firms, the estimate of prevailing market power, \(\beta\), is not necessarily the maximum level of market power. The maximum market power in our model would occur only when firms are both profit maximisers and can maintain perfect collusion (i.e. when \(\lambda_i = x_i/s_i\)).
ever, there is considerable precedent for its use in studies of this kind (see Bresnahan, 1989) and it does have a very useful advantage. Specifically, in Eq. (7') market power is dependent only on the point elasticity estimate — elasticity is constant along the demand curve. Removing the dependence of $x_i$ is very convenient because $x_i$ is a function of the unknown parameter $\alpha_i$: we do not know where on its demand curve a provider will be. Indeed, the output level of a profit maximiser will be lower than a marginal cost price.

The cross-sectional estimate $b_i^* \equiv \beta$ can be interpreted as the market power of the ‘sample mean’ provider. It represents the average market power that best fits the sample: actual sample providers may have market power that differs from this value.

2.2. Motivation

Actual mark-up rates will depend on the value of $\alpha$, the motivation parameter. However, we do not have an observable value for $\alpha$, and therefore we cannot estimate a point value of actual mark-up. Instead, we determine whether actual mark-up is different from zero and then develop this further to estimate a range of actual mark-up values. We draw on our assumption that motivation is partly determined by the characteristics of the provider: $\alpha_i = \alpha(y)$ to make these estimates. In particular, we distinguish between the private and non-profit sub-samples (see Section 1). The estimate of the representative (mean) provider’s mark-up in each of these sub-sectors of the market is analogous to Eq. (7'):

$$\frac{P_i - c_i}{P_i} = -\alpha_i \beta_i, \quad s = P, v \tag{7''}$$

where price and marginal cost are the provider mean values. For notation at convenience, $P_i$ will be written as $P_p$ and $P_v$ for each $s$ and similarly for marginal cost. Thus, we write:

$$\frac{P_p - c_p}{P_p} = -\alpha_p \beta_p(\alpha_p) \tag{21}$$

and

$$\frac{P_v - c_v}{P_v} = -\alpha_v \beta_v(\alpha_v). \tag{22}$$

These functions can be combined by subtracting one from the other to give:

$$P_p - P_v - c_p + c_v + \alpha_p \beta_p P_p - \alpha_v \beta_v P_v = 0. \tag{23}$$

This equation indicates that differences in prices between non-profit and private organisations are due to the difference in their respective marginal costs and
differences in the level of mark-up (which is a function of $\alpha_\nu$ and $\alpha_\nu$, respectively). Indeed, it provides an estimate of the relationship between $\alpha_\nu$ and $\alpha_\nu$:

$$\alpha_\nu = \frac{P_\nu - P_\nu - c_\nu + c_\nu}{\beta_\nu P_\nu} + \frac{\beta_\nu P_\nu}{\beta_\nu P_\nu} \alpha_\nu. \quad (24)$$

To derive this relationship we need to estimate the value of $(c_\nu - c_\nu)$ and for this we use a three-stage methodology. The first step is to estimate a reduced-form price equation using only the private sector organisations sub-sample. Using Eqs. (7) and (12) the reduced form equation is:

$$P_k = h_\nu^2 (w_\nu, r_\nu, y_\nu; \alpha_\nu, \lambda_\alpha, \theta_\nu, \alpha_\nu, \sigma_k) \quad (25)$$

where each $k$ is a private sector service sold and the subscript $\rho$ on each vector denotes that only private sector providers comprise its elements. Our stochastic approximation is:

$$P_k = \delta_0 + \delta_1 w_\nu + \delta_2 r_\nu + \delta_3 y_\nu + \nu_k. \quad (26)$$

The estimated parameters of this equation will only embody private sector supply relationship and so preserve the effect of private sector motivations.

Second, we ‘cross-predict’ a hypothetical private sector price using the estimated parameters from the reduced-form estimation and the mean values of the exogenous variables drawn only from the sub-sample of non-profit sector providers $(w_\nu, r_\nu, y_\nu)$:

$$P_{\rho} = \delta_0 + \delta_1 \bar{w}_\nu + \delta_2 \bar{r}_\nu + \delta_3 \bar{y}_\nu. \quad (27)$$

where the superscript denotes that price is derived using non-profit sector characteristics. In this way, the price function estimated in Table 3 is applied only to the non-profit sector sub-sample in order to generate a predicted private sector price given non-profit sector characteristics.

The third step is to estimate the elasticity of demand of the ‘sample mean’ provider in the non-profit sector and in the private sector. An interactive (slope) dummy as well as an intercept dummy for sector is employed. The modified version of Eq. (16) is thus:

$$P_{\rho} = b_0 + b_1 x_\rho + b_2 \rho x_\rho + b_3 w + b_4 r + b_5 z_{m\rho} + b_6 y_{m\rho} + b_7 \bar{x}_\rho + b_8 \rho + u_{\rho} \quad (16')$$

where $\rho$ takes a value of 1 for private sector providers and 0 otherwise. Thus, we can define the private sector elasticity as $dP_{\rho}/dx_\rho |_{\rho=1} = b_1 + b_2 = \beta_{\rho}$, and the non-profit elasticity as: $dP_{\rho}/dx_\rho |_{\rho=0} = b_1 = \beta_{\nu}$.

Footnote: It is assumed that the form of the (efficient, minimum) marginal cost function does not differ between sectors. Thus, the minimum marginal cost, $c_{m\nu,\nu}$ of providing an additional identical service is the same for all types of organisations, even though, accounting marginal costs, $c_{m\nu,\nu}$ may differ.
The underlying private sector supply relationship is preserved and, using our new terminology, can be written:

$$\frac{p_y - c_y}{p_y} = -\alpha_y \beta_y^y$$

(28)

where $\beta_y^y$ is the elasticity of the demand for this organisation. In supposing that this hypothetical private sector provider has the product characteristics of the average non-profit sector provider, then it will also have a non-profit sector demand function. The level of demand will be different because private sector providers would charge a higher price for the same service. But, given our constant elasticity demand function, we can assume that $\beta_y^y = \beta_y$. We can now advance the following lemma.

**Lemma 1.** Given that $p_y^p > p_y > 0$ and $\beta_y < 0$ (which are estimated below), the expected value of $\alpha$ for the whole market is greater than zero.

**Proof.** By contradiction we show that $\alpha_y = \alpha_u = 0$ cannot exist. Subtracting Eq. (28) from Eq. (21) gives:

$$c_y - c_p = p_y^u - p_y - \alpha_y \beta_y P_y + \alpha_p \beta_p P_y^u$$

(29)

which can be substituted into Eq. (23):

$$p_y^u - p_y + \alpha_y \beta_y P_y^u - \alpha_u \beta_u P_u = 0$$

(30)

or

$$\alpha_y = \frac{p_y^u - p_y}{\beta_y p_y} + \frac{p_y^u}{p_y}.$$  

(31)

Hence, when $\alpha_y = 0$ we have $\alpha_y \neq 0$ if $p_y^u > p_y > 0$ and $\beta_y < 0$ (i.e. because potential mark-up is greater than zero) from the estimation. □

This lemma implies that the expected value of $\alpha$ for the whole market must be different from zero.

2.3. Estimates of actual mark-up

Eq. (31) demonstrates that differences in prices can be attributed to some extent to the inequality of the values of $\alpha_y$ and $\alpha_p$. However, whilst we do not have specific values, we do know what values these parameters cannot take. We have assumed that: $0 \leq \alpha_y \leq 1$ and $0 \leq \alpha_p \leq 1$ and these limit values can be used to determine a more narrow range.
A whole range of values of $\alpha_\rho$ and $\alpha_s$ could have generated our estimated values of $P_\rho^v, P_v^v$ and $P_v^s, s = \rho, v$. To begin with, suppose that the underlying pattern of motivation is such that non-profit organisations are exclusively marginal cost pricers. If this set of motivations was the case then the estimated parameters $\beta_\rho, P_\rho^v$ and $P_v^v$ would be those generated with $\alpha_v = 0$ and for-profit motivation calculated from Eq. (31):

$$\alpha_\rho^p = \frac{P_v - P_\rho^v}{\beta_\rho P_\rho^v}. \quad (32)$$

Here the superscript on $\alpha_\rho^p$ is the assumed value of non-profit motivation used to derive for-profit motivation. Thus, we have removed the dependence of $\alpha_v$ in calculating the limit value of private sector motivation. Given our assumption that $\alpha_v < \alpha_\rho$, we have a minimum value for $\alpha_\rho^p$, which can be calculated from our estimates.

The alternative case is where the underlying motivation is that all private providers are profit maximisers. What are the implications of this set of motivation, corresponding to our estimated parameters, $\beta_v, P_v^v$ and $P_v^s$? Then $\alpha_\rho^1$ by construction and Eq. (31) gives the associated value for non-profit motivation:

$$\alpha_\rho^1 = \frac{P_v^v - P_v^s}{\beta_v P_v^v} \quad (33)$$

which is the maximum value of non-profit motivations. These calculations give us two sets of hypothetical limit values $[\{\alpha_v = 0, \alpha_\rho = \alpha_\rho^p\}, \{\alpha_v = \alpha_\rho^1, \alpha_\rho = 1\}]$ which can be used, respectively, to calculate the lowest and highest possible values of mark-up (using our estimates). We can then compare private and non-profit providers on the basis of both market power and actual mark-up. The latter is appropriate for estimating comparative allocative efficiency (Boadway and Bruce, 1984; Ng, 1982).

3. Empirical investigation

Following the above discussion our intention is to estimate the model in Eq. (16'). Three issues need to be addressed. First, what constitutes an observation for the cross-sectional analysis and what data are used? Second, what is the specification of empirical variables to proxy the terms in Eq. (16')? Third, we need to account for the endogenous variables, price and output, of Eq. (16').

3.1. The sample data

The data employed in this paper were drawn from a broader study of the needs and costs of residential care for people with mental health problems in a sample of...
English and Welsh services (Lelliott et al., 1996). Eight health districts were selected from those expressing readiness to participate in the study (two inner city areas in London, two suburban areas and four rural areas; seven English and one Welsh). The selection was made by the Royal College of Psychiatrists Research Unit (CRU) on the basis of population size, population density and Jarman’s (1993) underprivileged area score (Chisholm et al., 1997).

All facilities known in these areas with residents with a long-standing functional illness as their principal client group (thereby excluding nursing homes for elderly people, facilities for people with learning disabilities and hostels for the homeless) were contacted. These facilities could be managed by any agency (NHS, local authority, private or voluntary sector). Information about the facility was collected by interview with the facility manager. Data was also collected about all residents aged between 16 and 65 with mental illness by interviews with key workers. This data gathering was conducted between 31 March 1994 and 31 August 1994 and included a dedicated collection of service and other cost-relevant information.

The original study included all facilities providing accommodation for people with mental health problems. This paper is only concerned with facilities managed by agencies other than the NHS and thereby excluded acute psychiatric hospital wards, long-stay psychiatric wards and Forensic units. A number of low-staffed group facilities were also excluded, being out of the remit of this study (see Lelliott et al., 1996). The original study census found an eligible population of 1138 residents in 215 facilities. Residents in the private and voluntary sector facilities for which price data were available were included in the analysis. For local authority homes ‘prices’ were constructed from accounts information and other data sources.

The starting sample size was 496 residents with valid price data, who were residing in 112 facilities. Thus, price data were available for 44% of the eligible resident population and 52% of the facility population. Altogether, of the 496 cases, 38 cases were residents in 11 local authority facilities (but 10 of these cases had some element of missing data other than financial data), 426 were in 89 for-profit facilities (9 cases with some missing data) and 32 residents were in 12 voluntary sector facilities (0 missing cases). As might be expected, losses in cases due to missing price data were higher for the local authority and voluntary sectors (see Discussion).

Altogether the working sample size was 477 residents. The ‘non-profit’ subsection of the data constituted those residents from the voluntary and public facilities. Table 1a shows comparisons of price and output by sector. Prices varied a good deal between facilities in the sample, reflecting the varieties of case-mix that are served. The 10th percentile of the price distribution is £130.50 per week and 90th percentile is £300.00, with a median of £195.00. Prices do not vary significantly between non-profit and for-profit providers when comparing crude means values.
The data also indicate that providers differentiate prices between beds in their facilities. Of the 112 providers in the sample, 82 had more than one sample resident. Of these 82 providers, 28 (34.15%) had prices differentiated across the sample residents in the home. The greatest difference between the highest and lowest sample price among the survey providers is £58.

Output levels per provider (number of beds sold) are significantly different according to sector, with non-profits being on average 75% larger (p < 0.01). Size is often regarded as an important demand factor, and as such would be another source of product differentiation between providers.

3.2. Specification

The proxy variables collected in the survey that were used to generate an empirical specification of the theoretical model are described in Appendix A. Descriptive statistics are given in Table 1b.

A number of exogenous demand and cost shift factors are listed. The demand for a place in a facility and the marginal cost of that place are hypothesised to be affected by the provider’s service characteristics. Included were factors such as night nursing cover (‘no night cover’), staffing intensity (‘low staffed home’ and ‘low staffed sleep-in’) and services that cater for people with physical disabilities and those with alcohol misuse problems (variables respectively, ‘physical disabilities’ and ‘alcohol misuse’). These variables allow account to be made of market segmentation according to service characteristics (Eaton and Wooders, 1985). Demand may also be differentiated according to the facility’s client profile, but perhaps only in terms of easily observable factors such as age and sex.

The level of demand for a bed is also likely to be influenced by facility characteristics, in particular, the proportion of single rooms, bathrooms, communal living areas and staff areas. These factors are also expected to have a bearing on costs through their effect on the capital inputs required.

In Section 1 we argued that provider sector, in reflecting governance arrangements and provider motivation, affects demand. Explicit in Eq. (16′) is the assumption that sector has a demand price effect not only as a shift of the curve but also on the slope of the demand curve. We hypothesise that private providers have more elastic demand. As a result we would expect a negative coefficient, \( b_1 \), in Eq. (16′), but a positive coefficient, \( b_7 \), on the interaction term.

In addition, the different strategies, intentions and financial means of purchasers (purchaser’s preferences) were expected to have a bearing on demand. As a significant proportion of demand is expressed by local authority purchasers on behalf of clients and because the areas in the sample vary (especially in terms of income and deprivation), area dummies were used to capture this effect. The eight areas comprised two London (urban) areas, two Southern country (rural) areas, one Welsh (mainly rural) area, one Eastern rural area and two mainly metropolitan
Table 1

a: Price and output — by provider type

<table>
<thead>
<tr>
<th>Provider Type</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>For-profit providers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>212.6978</td>
<td>65.4800</td>
<td>108.0000</td>
<td>481.0000</td>
<td>417</td>
</tr>
<tr>
<td>Output</td>
<td>13.5396</td>
<td>10.0098</td>
<td>1.0000</td>
<td>47.0000</td>
<td>417</td>
</tr>
<tr>
<td>Non-profit providers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>200.9667</td>
<td>84.8518</td>
<td>103.0000</td>
<td>650.0000</td>
<td>60</td>
</tr>
<tr>
<td>Output</td>
<td>21.2167</td>
<td>19.3654</td>
<td>1.0000</td>
<td>54.0000</td>
<td>60</td>
</tr>
<tr>
<td>All</td>
<td>211.2222</td>
<td>68.2257</td>
<td>103.0000</td>
<td>650.0000</td>
<td>477</td>
</tr>
<tr>
<td>Output</td>
<td>14.5052</td>
<td>11.8552</td>
<td>1.0000</td>
<td>54.0000</td>
<td>477</td>
</tr>
</tbody>
</table>

b: Model descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Cases</th>
</tr>
</thead>
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<tr>
<td>Endogenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price (log)</td>
<td>5.3123</td>
<td>0.3005</td>
<td>4.6347</td>
<td>6.4770</td>
<td>477</td>
</tr>
<tr>
<td>Residents (log)</td>
<td>2.3649</td>
<td>0.8222</td>
<td>0.0000</td>
<td>3.9890</td>
<td>477</td>
</tr>
<tr>
<td>Exogenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No night cover</td>
<td>0.0231</td>
<td>0.1503</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Private sector</td>
<td>0.8742</td>
<td>0.3320</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Gender</td>
<td>0.5493</td>
<td>0.4981</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Age</td>
<td>54.4498</td>
<td>17.8731</td>
<td>5.0459</td>
<td>93.8508</td>
<td>477</td>
</tr>
<tr>
<td>Age squared</td>
<td>3283.5591</td>
<td>1974.2311</td>
<td>25.4607</td>
<td>8807.9707</td>
<td>477</td>
</tr>
<tr>
<td>Bathrooms per place</td>
<td>0.2813</td>
<td>0.2157</td>
<td>0.0333</td>
<td>1.0833</td>
<td>477</td>
</tr>
<tr>
<td>Living rooms per place</td>
<td>0.1609</td>
<td>0.1446</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Staff rooms per place</td>
<td>0.1040</td>
<td>0.1014</td>
<td>0.0000</td>
<td>0.5000</td>
<td>477</td>
</tr>
<tr>
<td>Physical disability</td>
<td>0.4151</td>
<td>0.4933</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Alcohol misuse</td>
<td>0.4319</td>
<td>0.4959</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Health district 2</td>
<td>0.2138</td>
<td>0.4104</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Health district 3</td>
<td>0.0776</td>
<td>0.2678</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Health district 4</td>
<td>0.0671</td>
<td>0.2904</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Health district 5</td>
<td>0.2055</td>
<td>0.4045</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Health district 7</td>
<td>0.1216</td>
<td>0.3272</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>No client contribution</td>
<td>0.0964</td>
<td>0.2955</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Full client contribution</td>
<td>0.5954</td>
<td>0.4913</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Number of beds</td>
<td>17.0356</td>
<td>12.3794</td>
<td>1.0000</td>
<td>56.0000</td>
<td>477</td>
</tr>
<tr>
<td>Low staffed home</td>
<td>0.1321</td>
<td>0.3389</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Low staffed sleep-in</td>
<td>0.2642</td>
<td>0.4413</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
<tr>
<td>Additional instruments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of beds squared</td>
<td>443.1405</td>
<td>666.0913</td>
<td>1.0000</td>
<td>3136.0000</td>
<td>477</td>
</tr>
<tr>
<td>Social interaction score</td>
<td>1.4211</td>
<td>0.9148</td>
<td>0.0000</td>
<td>3.0000</td>
<td>477</td>
</tr>
<tr>
<td>Mean emotional score</td>
<td>0.8550</td>
<td>0.6602</td>
<td>0.0000</td>
<td>3.0000</td>
<td>477</td>
</tr>
<tr>
<td>Mean emotional score squared</td>
<td>1.1677</td>
<td>1.4218</td>
<td>0.0000</td>
<td>9.0000</td>
<td>477</td>
</tr>
<tr>
<td>Global improvement</td>
<td>0.5409</td>
<td>0.4988</td>
<td>0.0000</td>
<td>1.0000</td>
<td>477</td>
</tr>
</tbody>
</table>
(mixed) areas from the Midlands and the North. Similar studies (e.g. Nyman, 1994; Propper, 1996) use area type dummies (urban and rural). Related research in the care of elderly people show that pricing regulation and contract arrangements by local authorities and local authority budgets have an important bearing on prices (Netten et al., 1998). Both these factors vary significantly across individual local authorities in the UK, not just types of authority. However, data of this specific nature were not available, and so recourse was again made to local authority area dummies. Different areas are also likely to have different prevailing input prices and therefore will shift service costs.

We also included indicators of whether client contributions were made to cover the facility’s charge. These variables are included to capture the effects of different sources of demand. In particular, clients who are publicly funded (since 1993) have their demands channelled via a care manager, who may have systematically different sets of preferences than private purchasing individuals. Clients that make no contribution will be local/health authority funded. We might expect the local/health authority to select the cheaper independent sector providers, although local authority provision is often more expensive (Netten et al., 1998). Also, local/health authority clients are often more dependent and so require more expensive services. We might then (weakly) expect this variable to be positively related to price.

A measure of the number of beds in each home was also included in the model. This variable acts both as a provider characteristics variable (consumers often have a preference for the size of home they wish to reside) and also as a marginal cost shift factor (see above).

The instruments used to identify the endogenous variables of our demand function are those that would enter the cost function (Eq. 3). To this end, two sets of factors believed to affect marginal costs were included in the estimation. First, a set of client dependency characteristics: social interaction score, mean emotional score and interviewers’ global impressions of resident well-being (see Lelliott et al., 1996). These factors are hypothesised to be associated with

---

3 No quantitative data were available to indicate mental health service purchasing philosophies of the eight areas, although they differed as noted in regard to income, deprivation and population size and also in local political make-up.

4 The individual characteristics used in the analyses were measured using data collected on the Resident Profile, covering 24 dimensions of individual behavioural, clinical and social characteristics (Lelliott et al., 1996). Some of these were grouped in summary scores, following factor analysis and other analyses, and based in part on face validity and other considerations. Grouped variables measured mental illness level, care needs, emotional vulnerability, daily living skills and social interaction. Single-domain or single-item indicators were constructed for aggressive/disruptive behaviour, suicidal thoughts or self-injury, alcohol or drug misuse, difficulties in getting up in the morning, time use, social mixing and social networks. These resident characteristics were not all independent of one another, but earlier factor analytic-based groupings removed some of the collinearity.
individual care costs. Second, non-linear home size variables were also used as instruments to capture the effects of scale economies.

3.3. Estimation

The residual demand function in Eq. (16′) has service mi’s demand and price as endogenous variables. The functional inter-dependence of these variables creates standard problems in OLS regression estimation. Therefore, a two stage least squares estimation (2SLS) technique was used (the system is over-identified) (Pindyck and Rubinfield, 1981). (See Appendix A and Table 1b for a description of the instruments.)

Heteroscedasticity is also a common problem with cross-sectional estimation. This problem manifests as inefficient estimation of standard errors (although coefficient estimates are unaffected). White’s (1980) consistent estimator of the variance–covariance matrix is used to overcome this problem. However, the problem of biased errors and so predicted values remains when log-specifications are employed and in two-stage least squares estimation (Manning, 1998). Remedial steps — ascertaining the form of the heteroscedasticity — were not practical so some caution must be used when considering the results. Non-logged versions of Eq. (16) did not change the results regarding the significance of the variables.

3.4. Results

Two 2SLS estimations are reported in Table 2. The first model is at the service level of analysis and the second is Eq. (16′) estimated at the provider level. In the latter case all service-level variables (price, client and service characteristic variables, were averaged over the number of residents sampled for the provider to give a single mean value at the provider level. All models were significant at the 1% confidence level (F-test). A Breusch–Pagan test for heteroscedasticity was undertaken and it was found that the null hypothesis of homoscedasticity was rejected at the 5% level. For this reason White’s adjusted t-ratios are given in the table. Also, a Hausman/Basmann-Sargan LM specification test was performed on each model. This test produces a statistic that corresponds to a χ² distribution with 5 degrees of freedom in this case. The data did not reject the null hypothesis of an appropriate specification of the instruments. The 2SLS errors are asymptotically normal and therefore a test for normality was deemed to be irrelevant in view of the large sample size.

3.5. Market power

The coefficient on xi and its interaction dummy were both significant and had the expected sign. The overall marginal effect was $dP_{mi}/dx_i = b_1 + \hat{P}b_1^2 = -0.1104$.
Table 2
Two stage least squares estimation — dependent variable is price per week (log)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Residents model</th>
<th>Home-level model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Co-efficient</td>
<td>Co-efficient</td>
</tr>
<tr>
<td>Constant</td>
<td>5.8668</td>
<td>-0.37053</td>
</tr>
<tr>
<td>No night cover</td>
<td>-0.54799</td>
<td>0.148238</td>
</tr>
<tr>
<td>Private sector</td>
<td>-0.35036</td>
<td>0.148575</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>-0.41301</td>
<td>0.54736</td>
</tr>
<tr>
<td>Age</td>
<td>-0.133838E-01</td>
<td>0.148238</td>
</tr>
<tr>
<td>Age squared</td>
<td>0.13580E-03</td>
<td>0.152689</td>
</tr>
<tr>
<td>Number of beds</td>
<td>0.15573E-01</td>
<td>0.437864</td>
</tr>
<tr>
<td>Bathrooms per place</td>
<td>0.10948</td>
<td>0.19126</td>
</tr>
<tr>
<td>Living rooms per place</td>
<td>0.16230</td>
<td>0.74358</td>
</tr>
<tr>
<td>Staff rooms per place</td>
<td>0.47825</td>
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</tr>
<tr>
<td>Physical disability</td>
<td>0.28382E-01</td>
<td>-0.22946E-01</td>
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<tr>
<td>Alcohol misuse</td>
<td>-0.40452E-01</td>
<td>0.08993E-01</td>
</tr>
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<td>Health district 2</td>
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<td>0.31365</td>
</tr>
<tr>
<td>Health district 7</td>
<td>0.25237</td>
<td>-0.26028</td>
</tr>
<tr>
<td>Full client contribution</td>
<td>-0.90138E-01</td>
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<td>No client contribution</td>
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</tr>
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<td>-0.25879</td>
<td>-0.14029</td>
</tr>
<tr>
<td>Low staffed sleep-in</td>
<td>-0.15824</td>
<td>5.8917</td>
</tr>
<tr>
<td>Number of residents (ln)</td>
<td>-0.28363</td>
<td>-0.23900</td>
</tr>
<tr>
<td>Residents (ln) × private</td>
<td>0.20166</td>
<td>0.18029</td>
</tr>
</tbody>
</table>

Heteroskedasticity — Breusch- Pag an (\(\chi^2, n = 21\))

| Specification — Basmann- Sarg an (\(\chi^2, n = 5\)) | 477 | 107 |

\(\hat{\rho}\) is the proportion of the private sector residents in the sample — hence the mean value of the private provider dummy. This estimate can be interpreted as the elasticity of the sample representative provider assuming that each provider's own products are similar, as indicated by Eq. (20). It corresponds to the Lerner index for the representative provider. In other words a profit maximising provider would at the margin set price some 11% above marginal cost.

The estimated function Eq. (16') also gives the elasticity of demand for the representative provider from the private (‘for-profit’) and non-profit sub-sectors. Respectively, these estimates are: \(dP_{i}/dx_{j}|_{\rho=1} = b_{1} = -0.08197\) and \(dP_{i}/dx_{j}|_{\rho=0} = b_{1} = -0.28363\). Non-profit providers are estimated to have (much) higher market power than private sector providers, a finding that supports our hypothesis as to the preferences of purchasers.
Table 3
Reduced form price equation — private organisation sub-sample. Dependent variable: price (log)
$R^2 = 0.61975$; Adjusted $R^2 = 0.59841$; $n = 415; F = 29.04$.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Co-efficient</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>5.5403</td>
<td>53.654</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>-0.25432</td>
<td>-6.960</td>
</tr>
<tr>
<td>No night cover</td>
<td>-0.25592E-01</td>
<td>-1.347</td>
</tr>
<tr>
<td>Age</td>
<td>-0.75094E-02</td>
<td>-2.414</td>
</tr>
<tr>
<td>Age squared</td>
<td>0.75929E-04</td>
<td>2.587</td>
</tr>
<tr>
<td>Bathrooms per place</td>
<td>0.10029</td>
<td>1.905</td>
</tr>
<tr>
<td>Living rooms per place</td>
<td>0.43795E-01</td>
<td>0.481</td>
</tr>
<tr>
<td>Staff rooms per place</td>
<td>0.24869</td>
<td>2.247</td>
</tr>
<tr>
<td>Social interaction score</td>
<td>0.12319E-01</td>
<td>1.035</td>
</tr>
<tr>
<td>Mean emotional score</td>
<td>0.11076E-01</td>
<td>0.274</td>
</tr>
<tr>
<td>Mean emotional score squared</td>
<td>-0.17028E-02</td>
<td>-0.100</td>
</tr>
<tr>
<td>Global improvement</td>
<td>-0.51528E-01</td>
<td>-2.716</td>
</tr>
<tr>
<td>Cat1: physical disability</td>
<td>0.70154E-01</td>
<td>2.361</td>
</tr>
<tr>
<td>Cat3: alcohol misuse</td>
<td>-0.46844E-01</td>
<td>-2.222</td>
</tr>
<tr>
<td>Health district 2</td>
<td>0.26182E-03</td>
<td>0.006</td>
</tr>
<tr>
<td>Health district 3</td>
<td>0.55170E-01</td>
<td>1.271</td>
</tr>
<tr>
<td>Health district 4</td>
<td>0.11982</td>
<td>2.402</td>
</tr>
<tr>
<td>Health district 5</td>
<td>0.25986</td>
<td>7.943</td>
</tr>
<tr>
<td>Health district 7</td>
<td>0.15625</td>
<td>3.741</td>
</tr>
<tr>
<td>Full client contribution</td>
<td>0.11826</td>
<td>2.441</td>
</tr>
<tr>
<td>No client contribution</td>
<td>-0.14080</td>
<td>-5.563</td>
</tr>
<tr>
<td>Low staffed home</td>
<td>-0.28313</td>
<td>-6.177</td>
</tr>
<tr>
<td>Low staffed sleep-in</td>
<td>-0.26286</td>
<td>-6.072</td>
</tr>
</tbody>
</table>

3.6. Actual mark-up

Results of the reduced-form price estimation using only the private sector sub-sample are given in Table 3. The estimated parameters of this equation will only embody the private sector supply relationship and so preserve the effect of private sector motivations. The cross-predicted private sector price is given by the inner product of the vector of non-profit sector sub-sample means and the coefficient vector: $P^x = \langle \bar{\delta}, \bar{K}_n \rangle = £220.89$. The mean of actual prices across the same (valid) sub-sample of non-profit sector residents is $P_n = 204.04$. Underlying this latter price are non-profit characteristics and actual non-profit motivations. The difference in mean cross-predicted price and mean actual price is statistically significant ($p < 0.01$).5

5 A Kolmogorov–Smirnov test casts some doubt on the normality of the distribution of this predicted price difference ($p = 0.36$). A non-parametric Wilcoxon Matched-Pairs Signed-Ranks Test found that the null hypothesis of no price difference was rejected with a probability of $p = 0.004$. 
Table 4
The range of values of sample average mark-up

<table>
<thead>
<tr>
<th></th>
<th>Lower limit</th>
<th>Upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_e$</td>
<td>0</td>
<td>0.79</td>
</tr>
<tr>
<td>$\alpha_v$</td>
<td>0.27</td>
<td>1</td>
</tr>
<tr>
<td>Private ($P - c$)/P%</td>
<td>2.20</td>
<td>8.20</td>
</tr>
<tr>
<td>Voluntary ($P - c$)/P%</td>
<td>0</td>
<td>22.45</td>
</tr>
<tr>
<td>Market average ($P - c$)/P%</td>
<td>1.93</td>
<td>9.99</td>
</tr>
</tbody>
</table>

As noted above $\beta_p^v$ is equal to the estimated non-profit elasticity, that is $\beta_p^v = \beta_e = -0.28363$. These values can be used with Lemma 1 to infer that mean whole sample mark-up is greater than zero.

Turning to our calculation of the limit values of motivation, the first limit case is when $\alpha_e = 0$. Using our estimates and Eq. (32) we have:

$$\alpha_p^0 = \frac{P_v - P_p^v}{\beta_p^v P_p^v} = 0.27.$$  \hspace{0.5cm} (34)

The alternative case is where we suppose that our estimates are generated with all private providers being pure profit maximisers, (so $\alpha_p = 1$). In this case, the associated limit value is derived from Eq. (33):

$$\alpha_p^1 = \frac{P_v}{P_p^v} - \frac{P_v - P_p^v}{\beta_p^v P_v} = 0.79.$$  \hspace{0.5cm} (35)

These calculations give us two sets of hypothetical limit values $[(\alpha_e = 0, \alpha_p^v = 0.27), (\alpha_p^1 = 0.79, \alpha_p = 1)]$. The corresponding actual mark-up estimates (as given by Eq. (7)) are reported in Table 4.\footnote{A sensitivity analysis was performed on the key parameters used in estimating actual mark-up. The upper and lower endpoints of the 95% confidence interval were used in various combinations for (a) the difference between the hypothetical cross-predicted price and the non-private mean price, (b) the estimated demand parameter $\beta_e$ for the non-private sector and (c) the estimated demand parameter $\beta_p$ for the private sector. In this fashion, private mark-up had a range of 0.01–16.62% and non-profit mark-up has a range of 0–40.48%. In terms of the average provider in the market, the expected range of actual mark-up is 0.01–19.63%. This lower value is close to zero because at the lower point of the confidence interval hypothetical cross-predicted price is only about 50p higher per week than the non-profit sector price.}

4. Discussion

The data indicate that our sample providers have market power allowing them to potentially set prices some 11% higher than marginal costs — the estimated
Lerner index was $-0.1104$. Market power was measured at 8.2% for private organisations, but was over 28% for non-profit organisations.

Nyman (1989) estimated a demand function for places in a nursing homes sample from Wisconsin, USA. He found that providers could set price over 50% higher than marginal costs (a Lerner index of $-0.59$ compared to our $-0.11$). This value is high in comparison to our findings. However, the two studies estimate market power for different market segments in different countries — they are not really comparing like-for-like. In particular, Nyman’s estimates are for the *private* purchase of nursing care, but in this paper most clients are publicly funded. Also, the focus in the current paper is only on services for people with mental health problems.

The propensity to set price in order to maximise profits is more difficult to establish; it depends on the objectives of providing stakeholders (Steinberg, 1987) and also incentives to make profits created by the prevailing governance arrangements. Nonetheless, by estimating cost differences between discrete types of provider, based on cost-relevant data, we were able to calculate a range of possible values of mark-up for the average provider. The calculation was made by defining the proportion of market power that is actually taken as surplus/profit to be on a 0 to 1 interval — the provider’s *profit weight* — and being clear that all organisations are constrained to have a profit weight of no less than 0 and no more than 1.

With this restriction, the data indicate that in the lower limit case when non-profit providers have a profit weight of 0, private providers have a weight of 0.27. The upper limit case when private organisations have a weight of 1, non-profit organisations have a value of 0.79. Therefore, the profit weight for private providers is between 0.27 and 0.21 higher than for non-profit organisations ($p < 0.05$). For the overall sample there is clearly a difference between potential and actual mark-up.

With respect to the comparative efficiency implications, do private providers have greater or lesser actual mark-ups than non-profit providers? At the lower limit private providers would use about a quarter (0.27) of their 8.2% market power to make profit: an actual mark-up of 2.2%. At the lower limit, non-profits have an actual mark-up of 0. The respective upper limit values of actual mark-up are 8.2% for private organisation and 22.4% for non-profits. It follows that the difference between actual mark-up varies between $+2.20\%$ and $-14.25\%$, depending on the profit weight used. We are therefore unable to say which type of organisation — private or non-profit — operates with higher actual mark-ups. However, we can make some progress here by looking at differences in observed prices.

In our sample, private sector average price (£213.80) exceeds the non-profit sector average, but the difference is relatively small (less than £10). Differences in these prices are due in the model to differences in both profit weights and
marginal costs. As average prices are little different then either one of these factors or the other (or both) must have a comparatively low value. For example, were non-profit organisations really operating with mark-ups some 14 percentage points higher than private providers, the implied difference in marginal costs would be very large — about £40 per week (20% of price) — for basically the same types of services. The implied difference in marginal costs between for-profit and non-profit organisations becomes much smaller for lower values of profit weight. Therefore, if we accept that the difference in (minimum) marginal costs between provider types is small in reality, we are left with the implication that providers are unlikely to be profit maximisers and that non-profits are likely to have very low mark-up levels.

The usual data limitations of cross-sectional social/health care studies are perhaps exacerbated in the case of mental health where care and treatment facilities are very far from standardised, where many agencies are involved and where funding is complex. The lack of consensus on the definition of good outcomes compounds the problem of finding appropriate measures of service quality. Included in the model were a range of process indicators of quality such as night nursing cover, staffing intensity and provider client categories (e.g. that cater for people with physical disabilities, those with alcohol misuse problems, etc.). However, measures of more intangible aspects of quality relating to user outcomes were not available. Despite a lack of direct measures, we might rely on indirect indicators as signals of quality intangibles, and one such measure that was included is provider sector (i.e. non-profit, private...).

Data limitations give rise to concerns about representativeness. Losses in cases due to missing price data were proportionately high for the local authority and voluntary sectors. This partly reflects the specialist nature of the missing facilities and the multiple sources of funding of their residents (obscuring the true price). The final sample is therefore not representative of the respective proportions of the total number of all types of facilities. For the population of the eight districts, the local authority and voluntary sectors both have approximately a 20% share of facilities (hostels). In the current sample these shares are about 10%. However, the sample is more representative of the ‘core’ industry where highly vertically differentiated products are absent. It seems reasonable to hypothesise that those facilities with missing or poor price data give low priority to financial matters and so are even less likely than sample non-profits to be rent-seekers.

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7 Also, a number of factors were tried, for example, the number of qualified (nursing) staff per home, proportion of single rooms, etc., but these factors did not prove to significant and were dropped.

8 The effect of under-representing quality and characteristics differences between providers services is likely to be an over-estimate of demand elasticity for the average provider.
5. Conclusion

The data were found to be largely consistent with our two hypotheses. First that average market power is relatively low. Second, regarding the comparative performance of providers under different governance arrangements, that non-profit providers would have higher market power than private sector providers, but a lower propensity to use market power to make profits. The whole sample Lerner index (market power) was 11%: 8.2% for private and 28% for non-profit organisations. Moreover, private providers are at least 25% more likely to be profit maximisers. The market power and profit weight estimates are consistent with both hypotheses.

We can then conclude that inter-sectoral differences are real in regard to pricing behaviour. The efficiency consequences of the implied pricing behaviour are more difficult to discern however. In the analysis we had to contend with two areas of limited data; first, providers’ actual (minimum efficient) marginal costs and, second, their motivations. Only by supposing that minimum efficiency marginal costs are similar (same cost-relevant factors) can we weakly infer that actual mark-up levels are higher in the private sector. Even then the differences are not large. Furthermore, comparative efficiency calculus would have to account for possible adverse selection (cream-skimming — see Forder, 1997) and better control for differences in users’ outcomes.

The economics of organisation assumes that governance choice is an endogenous decision. Williamson (1994) argues that transactions which differ in their attributes are aligned with governance structures in a ‘discriminating — mainly transaction cost economising — way’. As a positive prediction we might expect comparative differences in efficiency to be relatively small, as we found.

Information about pricing, provider behaviour and provider motivation is crucial in helping to guide policy makers in improving the mental health care system, in particular, regarding the use of market-centred rather than hierarchical means of organisation. This paper provides some of the required information and found a potential for efficiency savings associated with the right choice of governance.

Acknowledgements

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### Appendix A. Proxy variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Proxy definition</th>
<th>Proxies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demand</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x_i$</td>
<td>output</td>
<td>Number of residents in the home at time of sample (natural log)(^a)</td>
</tr>
<tr>
<td>$\mathbf{P}_{mi}$</td>
<td>price</td>
<td>Model price is the individual resident gross charge per week (logged)(^a)</td>
</tr>
<tr>
<td>$y_{mi}$</td>
<td>demand shift factors</td>
<td>(1) service characteristics home category 1: physical disability home category 3: alcohol misuse night cover low staffed facilities low staffed ‘sleep-in’ facilities age age squared gender (male) (2) sector private sector (3) facility characteristics (physical quality) bathrooms per bed living rooms per bed staff rooms per bed. (4) client funding full client contribution (to payment) zero client contribution (5) purchasers’ preferences health districts: 2,3,4,5,7</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x_i$</td>
<td>output</td>
<td>no. of residents(^a) (see above)</td>
</tr>
<tr>
<td>$\overline{x}_i$</td>
<td>capacity</td>
<td>number of beds at time of sample</td>
</tr>
<tr>
<td>$w, r$</td>
<td>input costs: area dummies</td>
<td>health districts: 2,3,4,5,7</td>
</tr>
<tr>
<td>$z_i$</td>
<td>cost shift factors</td>
<td>(1) individual’s characteristics mean emotional score(^b) mean emotional score squared(^b) social interaction score(^b) global impression score(^b) gender age age squared (2) service characteristics home category 1: physical disability home category 3: alcohol misuse night cover</td>
</tr>
</tbody>
</table>
J. Forder

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(3) facility characteristics
low staffed facilities
low staffed ‘sleep-in’ facilities
bathrooms per bed
living rooms per bed
staff rooms per bed.

(4) scale effects
no. of beds squared

Endogenous variables.
Non-demand instruments.

References


